In-Situ Electrospray Capture of Organic Bearing Particulates from Comets and Celestial Bodies, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

NASA has need for technologies that can enable sampling from asteroids and from depth in a comet nucleus, improved in-situ analysis of comets. It has been identified that there is also a requirement for improved dust environment measurements & particle analysis, small body resource identification, and/or quantification of potential small body resources (e.g., oxygen, water and other volatiles, hydrated minerals, carbon compounds, fuels, etc.). We propose to leverage past observations of the ability of electrospray ionization to capture and concentrate polar or polarizable trace species without damage, and combine that knowledge with recent discoveries in developing a hyper velocity ice-gun for NASA studies aimed at ice grain capture simulations. The phase I effort will focus on using the ice gun we created under prior NASA support, and add a novel electrospray cross-current element that creates a soft charging plume across a series of discrete deceleration aerogel plates that we believe will enable in-situ organic analysis capability previously unattainable on board a spacecraft using existing NASA mass spectrometer hardware.

Anticipated Benefits

The applications of the proposed technology for NASA include the means to employ MS to potentially non-destructively analyze organic trace species in ice grains traveling at hyper velocities of 5km/sec and above, simplifys the orbital mechanics required for sample interception.. The long flight time back to Earth results in significant discovery delays. With the proposed technology, NASA could perform in-situ organic analysis of incident ice grains in near real-time..

For Non-NASA applications, the technology being offered in this proposal include the potential for new methods of ambient pathogen capture and soft ionization for mass spectrometric analysis. In addition, other applications may include non-organic polar molecule charging suitable for thin layer deposition, chip fabrication, and other semiconductor uses.

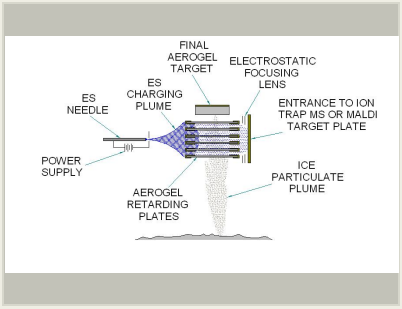

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Table of Contents

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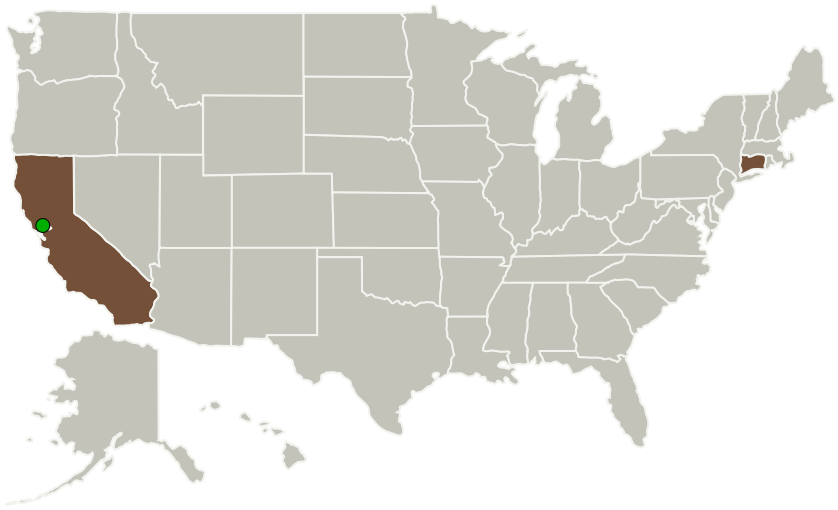
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Connecticut Analytical Corporation	Lead Organization	Industry	Bethany, Connecticut
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Connecticut

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141113)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Connecticut Analytical Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Joseph Bango

Co-Investigator:

Joseph Bango

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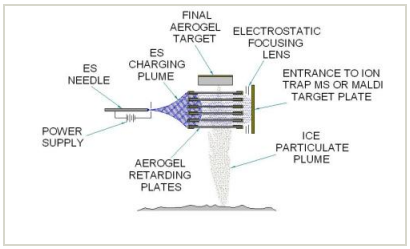
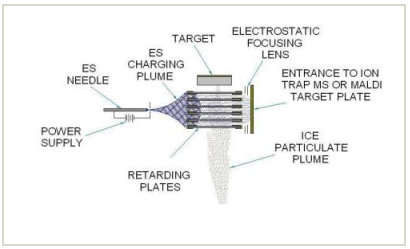
Images



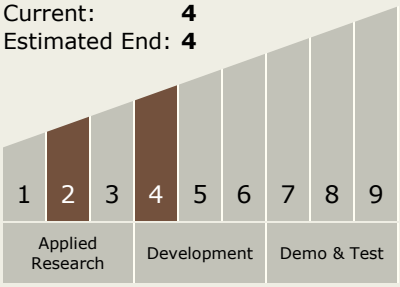
Briefing Chart Image
In-Situ Electrospray Capture of Organic Bearing Particulates from Comets and Celestial Bodies, Phase I
(https://techport.nasa.gov/image/134356)



Final Summary Chart Image
In-Situ Electrospray Capture of Organic Bearing Particulates from Comets and Celestial Bodies, Phase I
(https://techport.nasa.gov/image/134315)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destination

Others Inside the Solar System